**ANATOMIC REVIEW OF RENAL AND URINARY FUNNCTION**

* **Urinary systems**-kidneys, ureters, bladder and urethra

Kidneys- bean-shaped, brownish-red structures located retroperitoneally(behind and outside the peritoneal cavity

-Adrenal gland placed on top

-renal parenchyma divided into two (cortex and medulla)

- medulla contains loops of henle,versa recta and collecting ducts

-each kidney contains 8-18 pyramids which drain into 2-3 major calices that open to the renal pelvis

-kidney supplied by renal artery and drained by renal vein (branches of abdominal aorta and inferior vena cava)

**Nephrons**

* Each kidney has 1 million nephrons located at the parenchyma esponsible for initial formation of urine.
* Two type (cortical nephrons located in the outermost part of cortex-80-85% and juxtamedullary nephrons located deeper in cortex-15-20% (distinguished by long loops of henle surrounded by long long capillary loops called vasa recta
* Afferent and efferent bllod vessels are enclosed in an epithelial structure called bowmans capsule then proximal tubule, loop of henle, distal tubule and either cortical or mudullary collecting dact
* Renin produced by macula densa cells at the distal tubules

**Ureters, bladder and urethra**

-ureters- long fibro-mascular tubes connecting each kidney to the bladder (24-30cm long)

-have three narrow areas: ereteropelvicjunction,the ureteral segment near the sacroiliac joint and the ureterovesical junction all prone to obstruction by kidney stones

**Urinary bladder**

* Muscular hollow sack located behind the pubic bone
* Its vesicle contains two inlets and one outlet
* Contains four layer: FROM OUTSIDE: adventitia (made of connective tissues), smooth muscle layer known as destrusor, submucosal layer of loose connective tissue and mucosal lining (innermost layer)
* Bladder neck contains involuntary smooth muscles that form part of urethral sphincter

**Urine formation**

Formed in three steps: glomerular filtration, tubular re absorption and tubular secretion

Substances filtered by glomerulars, reabsorbed by tubules and excreted in urine include: sodium,chloride, bicarbonate, potassium, glucose, urea, creatinine and uric acid

NB: amino acids and glucose are filtered at the glomerulars and reabsorbed sothat neither is excrete in urine

**Urethra**

Arises from base of bladder, passes through the penis in males and in females it opens just anterior to the vagina

In male the prostate gland lies just below the bladder neck, surrounds the urethra posteriorly and laterally

Functions of the kidney

Urine formation

Excretion of waste products

Regulation of electrolytes

Regulation of acid base balance

Control of water balance

Control of blood pressure

Renal clearance

Regulation of red blood cells production

Synthesis of Vit D to active form

Secretion of prostaglandins

Regulates calcium and phosphorus balance

Activates growth hormone

**Renin angiotensin pathway**

Decrease in renal perfusion pressure or decreased salt delivery to kidney tubules e.g hemorrhage, heart failure, cirrhosis, loop diuretic and reduced salt intake\_\_\_\_\_\_\_\_\_\_ angiotensinogen from the liver converted by renin to angiotensinogen 1 which changes to angiotensinogen 11 by action of angiotensin converting enzyme from the langs

-It’s a powerful vasoconstrictor which increases pressure by : vasoconstriction, increased myocardial contractility and prostaglandin release

:increase circulating volume by: aldosterone release, sodium and water reabsorption, potassium excretion and ADH release.

**TESTS DONE IN RENAL DEASEASES**

**Intravenous urography**

It includes various tests such as excretory urography and intravenous pyelography (IVP) and infusion drip pyelopgraphy

A radio opaque contrast is administered is administered intravenously to show the kidneys, ureters and the bladder via x-ray imaging as the die moves through the upper and the lower urinary system.

**Nephrotomogram**

Carried out to visualize different layers of the kidney and different structures within the kidney and differentiate solid masses or lesions from cysts in the kidney or urinary tract.

**Urethrography**

Visualizes the urinary tract to assess urine flow through the urethra.

A urethral catheter is inserted and a contrast agent instilled into the bladder when the patient feels like voiding, the catheter is removed then the patient allowed to void. Mostly done when urethral trauma is suspected

**Cystography (cystogram)**

Evaluates vesico-urethral reflux (back flow of urine from bladder into one or both urethras)

A catheter is inserted and a contrast agent instilled to outline the bladder walls. The contrast agent instilled to outline the bladder walls. The contrast may leak through a small bladder perforation from injury.

X-ray of abdomen to locate kidneys, ureters and bladder

Computed tomography scan

Renal ultrasound

Renal biopsy- a small section of the kidney is removed to exclude carcinoma of the kidney

Renal function tests- shows ability of glomerular to excrete creatine and urea

Renal angiogram- to outline renal blood supply

**General signs and symptoms of genito-urinary disorders**

* Fever, weight loss and malaise are common

Changes in micturition

* Frequent micturition- may be due to injury to the bladder mucosa, infection, foreign bodies or tumor. These produce a functional decrease due to pain which results from mild stretching of the bladder
* Agency of micturition- strong desire to urinate. Involuntary urination may occur if voiding is not immediate. Voiding is usually in small amount of volume. The desire to urinate is almost constant until the voiding process.
* Dysuria- difficulty voiding. Suggest irritation or inflammation of bladder neck or urethra or bacterial infection
* Nocturia- excessive urination at night may come as a result of decreased renal concentrating ability, renal disease and diabetes mellitus. May also come as a result of excessive intake of fluids in the late evening or poor bladder training.
* Enuresis – bed wetting at night be physiological during the first 2-3years but later it can be due to delayed neuromascularmaturation.Can also come as a result of distal urethral stenosis in girls. And posterior urethral valves in boys. Neurogenic bladder can also be a possible cause.
* Hesitancy- un-due delay and difficulty in initiating micturition/ voiding straining and decrease in force and caliber of urinary system. This may be as a result of : symptoms of obstruction distal to the bladder, prostatic obstruction in men, urethral stricture and congenital urethral stricture in a child
* Incontinence- loss of urine without warning. As a result of atrophy of bladder, epispadiasis, prostatectomy, childbirth, congenital and acquired neurogenic and bladder dysfunction.

1. **Changes in urinary output**

* Polyuria- urine output of above 2500 mls daily found in diabetesmellitus
* Oliguria- urine output of below 500mls daily as a result of decreased renal perffussion
* Anuria- urine output below 100mls per day which may be a result of anemeia of anaphylactic shock.

1. **Changes in urine appearance**

* **Hematuria**- blood in urine or not noticeable depending on the amount of blood. This as a result of renal vesicle or prostatic disease tumor of bladder or kidney stones in the bladder
* **Pyuria**- pus in urine. Presence of white of white blood cells in urine, color changes to cloudy due to infection, cystitis, pyelonephritis, urethritis and tuberculosis of the kidney

1. **Pain**- felt in the flank or at the back between the 12th rib and the iliac crest/radiation to the epigastrium. Tenderness over the kidney pain is intermittent but doesn’t completely remit between pains of colic could be due to chronic cystitis.
2. **Retention of urine**- this causes agonizing pain on the supra-pubic area.
3. **Edema**- caused by excessive water and sodium retention in the extracellular surface as a result of abnormal renal excretion, abnormal cardiac or renal disease
4. **Hypertension**- This is due to increased renin production or secretion from obstructed side
5. Skin may show pallor suggestive of anemia, excoriations suggesting pruritus infection.
6. On palpation kidney bladder or prostate gland may be enlarged

**PYELONEPHRITIS**

Def: This is a bacterial infection of the kidneys partially of the renal pelvis, tubules and interstitial tissues of one or both kidneys and medulla

It can be acute or chronic

**ACUTE PYELONEPHRITIS**

**Predisposing factors**

* Bacterial ascending infection from the urethral meatus or through the blood stream.
* Urinary tract obstruction( increases the susceptibility to infection) caused by strictures or stones
* Diabetes mellitus
* Renal disease
* Pressure of a pregnant uterus
* Incompetence uretero-vesicle valve (trauma)
* History of urinary tract infection
* People who have bladder tumors
* Long term urethral catheterization

**Pathophysiology**

Infection spreads from the renal pelvis to the cortex. The pelvis, calyces and medulla of the kidney are primarily affected with white blood cells infiltration and inflammation. The kidney becomes grossly edematous and localized abscesses may develop on the cortical surface of the kidney.

**Signs and symptoms**

* Dysuria
* Agency in micturition
* Kidneys enlargement
* Urine contains proteins, numerous pus cells, bacteria and some blood
* Urine is cloudy and usually has an unpleasant smell i.e fishy odor associated with infection of E. coli
* Flank pain
* Hematuria
* Pyuria

**Systemic signs**

* Patient feels ill with general body malaise
* Pyrexia and hyperpyrexia
* Sweating rigors, chills nausea and vomiting
* Conversion in children
* Abdominal rigidity in severe cases
* The body shows leukocytosis (excess white blood cells)

**Diagnostic tests**

**Lab tests**

* Urinalysis to asses for pyuria and blood cells in the urine showing high bacterial count
* Gram stain of urine done to identify the infecting organism
* Urine for cuture and sensitivity tests to identify the infecting organism and most effective antibiotic
* White blood cell count (in FHG) to detect leukocytosis

**Confirmatory tests**

* Intravenous pyelography to evaluate the structure and excretory function of kidneys, ureters and bladder.
* Voiding cystourethrography- involves instilling contrast media into bladder then using x-rays to asses it and urethra when voiding
* Cystoscopy- directly visualize the bladder through a cystoscope

**Management**

* Treat the predisposing
* Ensure complete bedrest in acute phase
* Give appropriate antibiotics after isolating the micro-organism
* Nitrofurantoin 50-100mg 6 hourly for seven days (acts as a microbial antiseptic in patients with renal diseases)
* Antihemetics i.e plasil 10 mg once daily for one week
* Analgesics and antipyretics for relief of pain and temperature because stress response and delay healing
* Sodium bicarbonate (citrate) 3gm to keep the urine alkaline

**Nursing care**

* Complete bed rest since during rest slow rate in urine formation
* Vital signs four hourly when patient is in acute stage
* Monitor general appearance of the patient, excretion, urine colour, deposit/ smell or you instruct the patient to do it
* Observe the effects of drugs
* Maintain fluid balance chart (to monitor renal functions)
* Regular testing of the urine
* Since warmth relaxes muscles relieving spasms and increases local blood supply
* Apply warm compresses at the affected site to relieve pain
* Lie patient on the non-affected side to ease pressure off ureters
* Provide psychological and spiritual care
* Increase fluid intake unless contraindicated to dilute urine
* Discuss the need to avoid voluntary urinary retention and emptying the bladder every three-four hours
* Encourage patients to maintain generous fluid intake during hot whether
* Instruct women to cleanse the peritoneal area from front to back after voiding and defecating
* Teach clients to void before and after sexual intercourse to flush out bacteria introduced into the urethra and bladder

**Prevention**

**Provide instructions on the following topics:**

* Risk factors four urinary tract infection or minimize these factors
* Earlier manifestation of UTI and importance of seeking early medical intervention
* Maintain optimal immune system functions by attending to physiological and psychological strssors.
* The importance of completing the prescribed treatment and keeping follow up appointment

**Complications**

* Chronic pyelonephritis
* Hypertension

**Chronic pyelonephritis**

Def : This is a long standing urinary tract infections which affect one or more kidneys. It may continue progress to chronic renal failure.

**Predisposing factor**- Acute pyelonephritis

**Diagnosis**

* Intravenous urogram
* Creatinine levels are elevated
* Blood urea nitrogen
* Creatine clearance test

**Management**

* Admit patient and have complete bed rest
* Maintain strict input and output chart
* Administer intravenous fluid and maintain strict input output
* Nutrition care
* Take diet low in salt and proteins
* Transfuse in case of anemia
* Take urine for C/S
* If obstruction have surgery done
* Discharge patient on treatment
* Advice to seek medical care in care of relapse, observe hygiene and comply with medication.

**RENAL FAILURE**

Def: It is a condition in which the kidney’s are unable to remove accumulated (wastes) metabolites from the blood leading to altered fluid and acid base balance. OR Is the inability of the kidney’s to in adequately filter metabolic waste product from blood.

**ACUTE RENAL FAILURE**

**Def**: is a rapid decline in the kidney’s ability to clear the blood off toxic substances leading to an accumulation of metabolic products such as urea in the blood.

It is associated with decrease in urinary output less than 400mls (normal 100mls-1500mls), elevation of blood urea and nitrogen (normal 7-18 gl/dl) elderly 8-20mg/dl) and increased serum creatine (normal 0.6-1.2 mg/dl)

**Causes and classification**

1. **Pre-renal causes/ reversible causes**- these are factors outside the kidney that reduce renal blood flow and lead to decreased glomerular filtrate.

They include: hypovoleamia due to diarrhea, vomiting, hemorrhage and burns

: Cardiarc failure

:Nephrotoxic drugs e.g aminoglycosides like gentamycin

:Vascular obstruction

They could lead to in adequate renal perfusion, reduction in blood flow, reduced circulatory blood flow and shock

Condition that could lead to pre-renal causes

1. Ischaemia, tubular damage and reduction in glomerular filtration
2. Septic shock, septic arbotion, septicaemia and severe systemic infection
3. Pigmentation- hemoglobin transfusion reaction, hemolytic anemia
4. Loss of plasma- burns,crushedinjuries, convulsions and DM during which myoglobin (protein food in the muscles) responsible for color of tissue and its ability to store oxygen and hemoglobin are released causing renal toxicity and ischaemia
5. Nephrotoxins- these are toxins that damage the nephrones e.g aminoglycosides, antibiotis such as streptomycin and gentamycin, mercury and other heavy metals
6. Sodium and water depeletion- excessive vomiting snd diarrhea, diabetic ketoacidosis and severe sweating
7. **Renal causes**- these are conditions that directly damage the kidney or cause changes that reduce functioning of nephrones. They include:
8. Mechanical obstruction of urinary tract e.g stones, calculi, tumors and renal artery obstruction
9. Kidney disorders such as acute phyelonephritis, acute glomerulonephritis and malignant hypotension
10. Hypertensive vascularitis and disseminated intravascular coagulation
11. Acute tubular necrosis due to acute ischaemia or due to effects of toxic agents such as drugs or bacterial endotoxins
12. **Post renal causes**- these are causes beyond the kidneys within the urinary system
13. Prostatic hypertrophy
14. Tumors of the surrounding organs

**Clinical features**

1. Initiation phase- this may last for hours to two days. It begins with the initiating event e.g haemorrhage and ends when lobular injury occurs
2. Maintenance phase- characterized by significant fall in glomerular filtration rate and tubular necrosis. Oliguria may develop to some patients but in others the GFR remains normal
3. Recovery phase- characterized by a process of tubule repair and regeneration and gradual return of the GFR to normal

* Gastrointestinal tract manifestation include persistent anorexia
* The skin and mucus membranes are dry because of dehydration
* Immune function may be altered increasing the risk for infection
* Apathy
* Muscle twitching
* Drowsiness
* Stupor and coma due to acid base imbalance
* Salt retention cause edema increasing the risk for heart failure and pulmonary edema
* Potassium intoxication due to accumulation in the body
* Hypocalcaemia leading to progressive acidosis
* Anemia due to erythropoietin production suppression

**Investigations**

-Low specific gravity

-blood for urea and electrolytes

-High serum creatinin level

-Elevation of serum electrolyte levels

- IVP and intravenous ulorgram

- Abdominal x-ray

-Urine for culture and sensitivity

**Pathophysiology**

When the kidneys are un-able to remove the bodies metabolic waste or perform their regulatory functions, renal failure results. These substances instead of being eliminated in urine, accumulate in the body fluid leading to a disruption and acid base disturbances.

Impaired renal excretion of body fluid results to subsequent loss of kidney function. In response the kidney’s become swollen, edematous and epithelial cells of tubules undergoes necrosis.

**Principles of management**

1. Prompt institution of emergency measure- prevent death from hypokalaemia, shock, pulmonary edema by hemodyalysis, hemofiltration or peritoneal dialysis
2. Determination of the underlying cause and instituting appropriate treatment
3. Maintenance of a satisfactory clinical and metabolic state during oliguria phase
4. Replacement of fluid loss and careful control of electrolyte and fluid balance during the diuretic phase
5. Prevention of infection
6. Maintenance of adequate nutrition
7. Specific nursing care

**Emergency resuscitative measures**

1. Prompt transfusion in the presence of reduced circulatory blood volume and plasma
2. Replacement of food loss
3. Haemodialysis/peritoneal dialysis to remove sodium and water retention. Give intravenous glucose, insulin calcium gluconate and bicarbonate.
4. Sorbitol induces water loss in the gastro-intestinal tract
5. Retention enema is given to remove potassium ions

-Sodium carbonate is given to elevate plasma PH level which causes the potassium ions to move into the cell.

6. Eliminate all sources of potassium in a patient’s diet

7. Insulin also promotes the transfer of potassium ions into the cells.

**Reaction during Oliguric phase (lasts up-to 10-20 days)**

* Control fluid and electrolyte balance.
* Daily fluid intake equal to urinary output-500 mls to replace insensible loss
* Daily weighing of the patient since is expelled to lose 0.2-0.5kg
* Strict and accurate fluid balancing.
* Blood pressure and clinical status of the patient
* Parenteral, oral input and output of urine, gastric drainages, stools, wound drainage and respiration are calculated and used as basis for fluid replacement.

**Drugs and medications**

Intravenous fluids such as manitol and 50%dextrose, injection lasix 120mg stat then 40-80 give 6 hourly.

Sodium bicarbonate and insoluble insulin are given about 10-20 intravenous aluminum hydroxide is given to help prevent rising of serum phosphate levels. Glucose infusion and multivitamins are given.

**Maintenance of nutrition**

-Protein is restricted to 1gm/kg to break down protein tissue and to prevent accumulation of toxic eg urea product

-high carbohydrate intake to provide energy about 200-2500 kilocalories.

-Fruits and fluids containing phosphorous and potassium are restricted.

-potassium intake is restricted to 40-60mls equivalent to Sodium 1.5 grams a day.

**Specific nursing management**

-Measures to prevent pressure sores, stomatitis, chest infection and complications

-Provision physical emotional, psychological and spiritual support both to the patient and relatives

- Keep the patients family informed about his/ her condition

-Daily 24 hour nursing care

- Close monitoring of patients serum electrolyte levels

- Cardiac function and muscular skeletal status are closely monitored

- Close and regular observation

- Complete bed rest to reduce exertion and the metabolic rate

- Fever and infection are treated promptly

- Physiotherapy to prevent chest complications

- Involve patient’s relatives in day to day care of patients

**Prevention**

* Adequate hydration
* Patient with indwelling catheters
* Proper screening of blood
* Use of aseptic technique during wound dressing to prevent septicemia
* Close monitoring of the critically ill
* Patients with indwelling catheters should be given meticulous catheter care.

**CHRONIC RENAL FAILURE**

Def: is a progressive irreversible deterioration in renal function in which the body’s ability to maintain metabolic fluid and electrolyte balance fails.

**Causes**

* Associated with azotemia
* In CRF there is almost 80% loss of nephrones thus referred as end stage renal disease
* CRF is mainly caused by systemic disease such as DM and severe hypertension
* Chronic glomerulonephritis and pyelonephritis
* Hereditary lesions e.g polycystic disease of the kidney
* Autoimmune disease
* Gout
* Toxic agents like lead and mercury
* Vascular disease

**Pathophysiology**

Following the deterioration and loss of nephrons, the sum total of renal function progressively reduces too especially if the underlying systemic disease e.g DM is not well controlled consequently the GFR falls as serum creatinine reduces too along with continued accumulation of nitrogenous wastes.

The remaining nephrones hypertrophy as they are required to filter a large load of solutes nevertheless the kidney continues losing its ability to concentrate urine adequately. In attempt to continue excreting solutes, a large volume of dilute urine is passed making the patient susceptible to fluid depletion.

On the other hand the tubules gradually lose the ability to reabsorb electrolytes; this initially leads to salt wasting in which urine contains large amounts of sodium enhancing polyuria further. As the number of functioning nephrones keeps declining further along with GFR, the body is unable to get rid of water, salts and nitrogenous waste. By the time GFR is less than 20ml/min, the body is severely uremic which has far reaching effects to all body systems

**Stages of CRF**

It depends on degree of nephrone loss and GFR

**Stage one** : reduced renal reserve

-There is 40-75% loss of nephrone function

- Patient is asymptomatic because nephrones are able to perform renal functions

- Patient only presents with polyuria and nocturia secondary to reduced ability to concentrate urine

**Stage two**: renal insufficiency

* There is 75-90% loss of nephrone function
* Serum BUN and creatinine is elevated
* Kidney loses ability to concentrate urine
* Patients develops anemia besides oliguria and edema
* There is reduced response to diuretics

**Stage three**: End stage renal disease (ESRD)

* The final stage of CRF
* Less than 10% nephrones are functioning
* Regulatory excretory and hormonal functions of the kidney are severely impaired
* Patient develops weight loss and uremia

**HOW CRF MANIFESTS IN VARIOUS BODY SYSTEMS AND FUNCTIONS**

1. **Electrolyte imbalance**

* Initially hyponatremia and later hypernatremia with hypertension
* Hyperkalemia associated with cardiac dysrythmias
* Hypocalcaemia due to reduced tubular reabsorption of calcium and reduced activation of Vit D by the kidney
* Hyperphosphatemia due to reduced secretion of phosphorus which causes increased secretion of parathyroid hormone to facilitate phosphate excretion and increase in calcium resorption from the borne

1. **Hematological changes**

* Anemia (normochromic and normocytic) with fatigue, cold, dyspnoea and air hunger following impared erythropoietin production
* Trhombcytopenia which is associated with bleeding tendencies

1. **GIT changes**

* Uremic fetor i.e ammonia odor in breath
* Nausea and vomiting, anorexia and hiccups due elevated serum nitrogenous wastes
* Complains of metallic taste
* Weight loss (cachexia) secondary to increased proteins catabolism
* GIT bleeding probably due to stress and uremic ulcers along with thrombocytopenia defect
* Hyperacidity
* Stomatitis, gingivitis and parotitis following poor oral hygien and ammonia formation from salivary urea
* Diarrhea and constipation
* Thirst due to hypernatremia

1. **Dermatological and musculoskeletal manifestations/changes**

* Pallor
* Dry and itchy skin secondary to dehydration and atrophy of sweat glands
* Osteodystrophy i.e osteomalacia and osteoporosis
* Bone (joint) pains a sign of osteoporosis
* Skin develops a grayish tinge secondary to anemia
* The skin develops a yellowish tone due to accumulation of carotenoids or urochrome pigments.
* The skin is edematous ecchymotic and easily bruised.

1. **Cardiovascular and pulmonary manifestations/changes**

* BP may be increased, normal or decreased
* ECG changes secondary to electrolyte imbalances
* Kussmaul breathing peri-orbital edema dyspnoea, reduced SPO2, tachypnea, chest pain and wheezing
* Delayed capillary refill
* Pericarditis following irritation of pericardial lining by uremic toxins
* Pericardial temponade
* Hyperlidaemia
* Chest crackles on auscultation
* Coughs thick tenacious sputum
* Reduced cough reflex
* Engorged neck veins

1. **Genital-urinary manifestations**

* Fluid electrolyte imbalance
* Muscle twitching and cramps
* Fatigue and general body weakness following toxins accumulations
* Anuria and oliguria
* Erectile dysfunction especially if diabetes is the underlying disease

1. **Endocrine and metabolism manifestations**

* Metabolic acidosis secondary to in ability of renal tubules to regenerate bicarbonate and secrete hydrogen ions in urine. Also due to inability of tubules to excrete ammonia and reabsorb sodium bicarbonate
* Reduced excretion of phosphates and other organic acids
* Increased rennin secretion resulting in hypertension
* Inability for the kidney to excrete insulin resulting to hyperglycemia
* Breakdown of calcium phosphorus and VIT D pathway thus renal bone disease
* Reduced or absent erythropoietin production

1. **Neurological and psychological**

* Apathy and unrealistic interpretation of information
* Activity intolerance and restless
* Seizures and convulsions
* Depressed cognitive and thought process
* Mental confusion
* Reduced response to stimuli

**Diagnostic evaluation of chronic renal failure**

* Blood chemistry
* Urinalysis
* Determination of creatinine clearance and GFR
* Renal scan to rule out tumours
* Abdominal ultrasound
* Urodynamics e.g intravenous urogram to explore blood supply to the kidney
* Full haemogram to rule out anemia and thrombocytopenia
* Blood and urine culture where septicemia is suspected
* FBS and RBS
* Lipid profile
* Coagulation screen tests
* Baseline chest x-ray to rule out pulmonary edema and pleural effusion

**Management of CRF**

* Correction of aggravating factors factors e.g volume depletion, infections, hypertension, nephrotoxins, hyperglycemia etc
* Administration of antihypertensives e.g norvasc 10mg o.d per oral (a calcium channel blocker)
* Paracentesis (ascetic tapping) in-case of fluids in the peritoneal cavity
* Administration of non nephrotoxic antibiotics in-case of an existing infection e.g augmentin 625 mg bd
* Administration of synthetic erythropoietin e.g eposen and iron supplements to correct anemia. Transfusion can also be done
* Administration of phosphate binding agents and calcium supplements. Aluminium based antacids to bind phosphorus in the GIT. However considering side effects of aluminium carbonate can be used in its place
* Administration of diuretics with inotropic agents e.g lasix with digoxin
* Sodium bicarbonate supplements to correct acidosis for severe acidosis, dialysis is done
* Use intravenous valium or phenytoin to control seizures and ensure bedrails are padded
* Restrict salt and water intake e.g 1500mls/day and maintain a running balance
* Administration of antihistamines and phosphates restriction to control proritus
* Dietary management to include: provision of high calorie diet to prevent catabolism of protein tissue
* Low protein diet is preferred to prevent acidosis via uric acid waste product
* Restrict salt intake
* Supplement water soluble vitamins that are lost during dialysis or polyuria
* Give folic acid supplements

**Nursing care**

* Maintain strict input and output charting and maintain a running balance
* Maintain patency of intravenous lines and sterility of dialysis accesses e.g fistulas
* Administer medications as ordered
* Ensure patient is prepared for dialysis
* Nurse the patient propped up and if dyspnoic have him on oxygen (amount depends on SPO2 levels
* Monitor the patients weight daily
* Check out for and report diminished breath sounds, chest pain and poor SPO2 levels
* Regular GIT assessments including bowel patterns
* Offer small frequent meals, antiemetics and antiulcer drugs
* Provide dietary suppliments e.g vitamins and appetizers
* Do regular monitoring of serum albumin since patients started on dialysis with albumin die within the first year
* Reduce protein intake and serve proteins low in purines
* Observe for features of anemia
* Try to understand value for renal patients
* Monitor patients level of consciousness
* Provide a safe environment
* Involve counselor, social worker and priest in the care
* Encourage ambulation and arrange for physiotherapy
* Observe dietary manifestations for calcium and phosphate
* Ensure patient has adequate rest and sleep
* Skin care to include pressure area care, daily baths and application of moisturizers
* Ensure good hydration status for such patients
* Take measures to prevent pruritus
* Liaze with nephrologists when the patient is on anti-hypertensives and anticoagulants

**DIALYSIS**

**Def**: Is the process of removing waste products and excess water from the body when the kidneys cannot do so.

It is done in two methods:

1. **Hemodialysis**- this is a clinical technique in which substances move from blood through a semi-permeable membrane into a dialysis solution known as dyalysate)

* Blood is removed from the body and pumped into a machine that filters the toxic substances from the tissues.

1. **Peritoneal dialysis**- fluid containing a special mixture of glucose and salts is infused into the abdominal cavity where it draws toxic substances from the tissues. The fluid is the drained out and discarded. The quantity of glucose can be adjusted to remove more or less fluid from the body.

**Purpose of dialysis**

-Treatment of drug overdoses and poisoning

-Correct fluid electrolyte imbalance

- Remove waste products in renal failure

**Indications**

* Uremic encephalopathy
* To remove the end products of protein metabolism such as urea
* To maintain a safe concentration of serum electrolytes
* To correct acidosis and replenish the blood’s bicarbonate levels
* To remove excess fluid from the blood
* Pericarditis
* Heart failure
* Hyperkalemia
* Long term therapy for chronic kidney failure.

**Complications of hemodialysis**

* Fever- due to overheated dialysate
* Anaphylaxis-life threatening allergic reaction to substances in the machine
* Low blood pressure- caused by changes in serum osmolarity and rapid removal of fluid from the vascular compartment
* Abnormal heart rythms/cardiarc dysrythmias from potassium imbalance
* Air embolus if it enters the machine
* Bleeding in the intestines, brains and eyes due to heparin used to prevent clotting in the machine
* Infection may be local or systemic due to white blood cells damage and immune system suppression.

**Peritoneal dialysis**

Here the peritoneum acts as a permeable filter. This membrane has a large surface area and a rich network of blood vessels. Substances from the blood can easily filter through the peritoneum into abdominal cavity if conditions are right. Fluid is infused through a catheter inserted through the abdominal wall into the peritoneal space within the abdomen. Fluid must be left in the abdomen for a sufficient time to allow waste materials from the blood stream pass slowly into it. Then the fluid is drained out, discarded and replaced with fresh fluid.

NB: The dialysate is allowed to run into the peritoneal cavity by gravity flow. It is warmed slightly to avoid chilling the client and dilute the peritoneal blood vessels, thus facilitating substance exchange

**Principles used in p.dialysis**

-Diffusion

-Osmosis

-Ultrafiltration

**Contra-indications of peritoneal dialysis**

* Clients who had resend abdominal surgery with drains or tubules that may increase risk of infection
* Clients with significant long disease
* Peritonitits
* Hypercatabolism in which peritoneal dialysis cannot adequately clear uremic toxins
* Poor conditions of the peritoneal membranes because of adhesions of scurring
* Obesity with excessive fat deposits
* Abdominal disease
* Abdominal malignancies
* Severe vascular disease
* Back problems because the increased weight of fluid may increase back strain
* History of multiple abdominal surgical procedures

Types of peritoneal dialysis

* Continuous ambulatory peritoneal dialysis
* Automated peritoneal dialysis
* Continuous cyclic peritoneal dialysis
* Intermitend peritoneal dialysis
* Night intermitend peritoneal dialysis

Indications of peritoneal dialysis

* Patients with heart conditions that cannot withstand hemodialysis
* Patients who can continue with dialysis at home once given instructions at home
* In cases of abdominal trauma as a means of lavage
* Treatment of peritonitis by adding antibiotics to the dialysate
* Diabetic patients
* Chronic renal failure patients in which blood vessels have collapsed
* Infants and young children due to difficulty in vascular access

**Phases of peritoneal dialysis**

**Inflow (fill) phase**- the prescribed amount of dialysate is infused through an established catheter for about five to ten minutes

**Dwell (equilibrium) phase**- this is the period with which diffusion or osmosis occurs between the patient’s blood and the peritoneal cavity. It can take minutes to hours depending on method of dialysis is being used

**Drain (emptying) phase**- this is a period of emptying the dialysate from the peritoneal cavity. This may be enhanced by changing position or massaging the abdomen. Once the previous dialysate is drained out another infusion is made and the cycle continues.

**Complications**

-Peritonitis

-Leakage through incision site

-Bleeding associated with catheter insertion

-Hernia development due to intra abdominal pressure

**TUBERCULOSIS KIDNEY**

Def: It is a secondary infection caused by pulmonary tuberculosis

**Etiology**- Mycobacterium Tuberculosis

**Pathophysiology**

It occurs after tuberculosis invades the kidney. Early in the disease, renal cortex or medulla is affected. Tissue damage is progressive and eventually the renal cortex can rupture into the renal pelvis and infection can spread via mucosa of the remainder of the urinary tract. If infection involved ureters, structures can develop complicating the infection by causing and obstruction. In addition, blood supply will also be affected due to redestruction of kidney tissues by masses of tubercles, initially collateral circulation will become insufficient and the kidney become ischaemic.

**Clinical features**

They are mild and include:

-unexplained weight loss

- Loss of appetite (anorexia)

- Fever

- Hematuria may be present

- General body malaise may be present

- Pyuria

**Diagnosis**

* ESR is elevated
* Urine sample for mycobacterium tuberculosis
* Intravenous ulogram
* Cystoscopy since it can advance and affect the bladder
* Kidney biopsy

**Management**

* Anti-TB medications regime
* Medications typically used include ispniazid, rifampisin and ethabutol
* If the spread of infection has caused structural damage, a nephrectomy or urinary diversion may be necessary
* Nursing care e.g pain management, education regarding medication regime to continue with medication after symptoms subside
* Educating the patient, family and community regarding the risk factors and prevention of TB
* Advice the patient on condom use during sexual intercourse to avoid spread
* Patients with affected penis or urethra should abstain from sex during medication.
* Re-start the treatment in-case of relapse

**Complications**

* Urethral stenosis
* Bladder stricture
* Multi drug resistand TB (MDR)

**RENAL CALCULI**

Def: These are hard stone-like masses that form anywhere in urinary tract and can cause pain, bleeding, obstruction of urinary flow or infection

OR They are crystalline structures made up of materials of kidney excretion in urine which include: calcium salts, uric acid or magnesium ammonium phospate

Lithiasis means stones formation. When stone forms in the kidney it is known as **nephrolythiasis** and if it forms elsewhere in the urinary tract e.g the bladder it is called **urolythiasis**

**Predisposing factors**

* Personal family history of urinal calculi
* Dyhydration with resultant increased urine concentration
* Excessive dietary intake of calcium leads to hypercalce-urea precipitate calciumoxalate
* Gout and leukemia predispose to uric acid calculi from its side
* Urinary stasis or repeated infections
* Urethral twist or kink
* A large prostate gland in male
* Excessive --intake of milk in peptic ulcer (milk-alkaline syndrome)
* Inflammatory bowel disease with resection of small intestines i.e illeostomy
* Vitamin deficiency
* Tumors of either abdominal or pelvic organs pressing on the ureter preventing free flow of urine

**Clinical features**

* Tenderness and dull ache in the loins on back worse on movement
* Ureteric renal colic characterized by an excrutiating pain in the flank that spreads across the abdomen
* Manifestations of UTI including chills and fever
* Manifestations as result of obstructed urine flow with resulting distension and tissue trauma caused by passage of rough edged crystalline stone.
* The severity of pain often causes a sympathetic response with associated nausea, vomiting, pallor and cool clammy skin.
* A small stone may be passed in urine
* Recurrent kidney infection
* Trauma may cause gross hematuria

**Pathophysiology**

When the concentration of an insoluble salt in the urine is very high i.e when the urine is supersaturated, crystalls may form which disperse and are eliminated because the bonds holding them together are weak.

However the nucleus of crystals may develop stable bonds to form a stone. More often crystals form around an organic matrix or mucoprotein nucleus to become a stone.

The stimulus required to initiate crystallization in supersaturated urine may be minimal. Ingesting a meal high in soluble salt or decreased fluid intake as occurs during sleep allows the concentration to increase to the point where precipitation occurs and stones are formed and grow.

When fluid intake is adequate, no stone growth occurs. The acidity or alkalinity of urine and presence or absence of calculus inhibiting compounds also affect lithiasis.

**Types of ksidney stones**

1. **Calcium stones (common 75-80%)**- composed of calcium phosphate. They are generally associated with high concentration of calcium in the blood or urine.
2. **Uric acid stones**-develop when the urine concentration of uric acid is high. They are more common in men and we are associated with gout due to accumulation of uric acid in joints.
3. **Sturvite**-they are associated with UTI caused by urea producing bacteria such as proteus. These stones can grow to become very large filling the renal pelvis and calyces.
4. **Cystirie stones**-are rare associated with a genetic defect in renal absorption of cystine ( an amino acid).

**Diagnostic tests**

1. Urinalysis-theassess for hematoria and a possible presence of white blood cells and crystals fragments. The urine Ph is helpful in identifying the type of slime, check for bacteria.
2. Chemical analysis-of any stones passed in the urine determines the type of stone and suggests measures to prevent further stone formation.
3. Urine calcium, uric acid & oxalate-measure the amount of thesesubstances excreted over 24 hr period and may be assessed to help identify possible causes of lithiusis.
4. Serum calcium phosphorous & uric acid-levels may be obtained to help identify factors contributing calculi formation.
5. KUB ( kidney’s, urethers &bladder)- is a flat plate x-ray of the lower abdomen that requires no special preparations. Calculi may be identified as opacities in the kidney urethers & bladder.
6. Renal ultrasunography- it is a non-invassive test that uses reflected sound waves to detect stones and ellaviate the kidneys for possible hydronephorosis.
7. Computed turnography-CT scan of the kidney with or without contrast \medium , uses x-ray, directed at the kidneys from many angles to provide a computed generated photography that shows calculi, ureteral obstruction and other renal disorder.
8. IVP- intravenous pyelography may be done to visualize KUB after infection of a contrast media.
9. Cystoslopy-used to visualize and possibly remove calculi from the urinary bladder and distal ureters.
10. HX of previous renal stones
11. From clinical features

**Management**

* An acute episode of renal colic is treated with and hydration e.g morphine sulphate is given intravenous to reduce pain
* Oral or intravenous fluids reduce the risk of further stone formulation and promote urine output
* After analysis of calculus, various medications may be ordered to inhibit or prevent further lilthiasis
* A thiazide diuretic frequently prescribed for calcium acts to reduce urinary excretion and is very effective in preventing stones
* Potassium citrate alkalinizes urine (raises the PH) and is for preventing stones that tend to form acidity urine

Dietary management

* Increased fluid intake which prevents the stone forming salts from becoming concentrated enough to precipitate
* For calcium stones, dietary calcium and Vit D enriched foods are limited which inhibits the absorption of calcium from the GIT
* Limit phosphorus and oxalate in diet if patient has calcium stones
* Clients with uric acid stones requires a diet low in purines like organs meat
* Recommend patient to take a diet rich in urine alkalinizing foods

**Surgery**

* Treatment of existing calculi depends on the location of the stone, the extend of obstruction, renal function or absence of UTI and clients general state of health
* In general the stone is removed if it is causing :severe obstruction, infection, unrelieved pain and serious bleeding
* **Lithotripsy** – using sound or shock waves to crash the stone is the preferred treatment for urinary calculi

**Nephrectomy**

This is the removal of kidney if its non functional secondary to infection or hydronephrosis

**Complications**

-Obstruction- stones can obstruct urinary system at any point

-Hydronephrosis- kidneys continue to produce urine causing pressure

-Infection- urine stasis associated with partial or complete obstruction increases the risk of urinary tract infections

**Prevention**

-Diuretics reduce new stone formation

-Taking large amount of water

-Avoid oxalate rich foods like spinach, nuts, pepper and tea

-Low diet in meat, fish and poultry for they increase level of uric acid

**RENAL TRAUMA**

**Causes**

* Pelvic fractures
* Road traffic accidents
* Small internal laceration’s of the kidney
* Penetrating or perforating wound
* Pelvic surgery
* Blunt crashing injuries
* Radiation therapy

**Clinical features**

* Hematuria
* Decreased urinary and pain
* Low blood pressure if severe shock
* Renal colic due to clots/fragmentations obstructing the connective

Diagnosis/ investigations

-History taking

-Physical examination

-Clinical manifestations

-Intravenous pyelogram

- Hemoglobin and hematocrit levels

- Urinalysis to note hematuria

**Management**

**Aims**

* To control hemorrhage, pain and infection
* To preserve and restore renal function
* To maintain urinary drainage
* To prevent loss of electrolyte balance

There are three types of management

* Active resuscitative management
* Conservative management
* Surgical intervention

Active resuscitative management

* Treatment of shock if present
* Control bleeding
* Maintain whole blood pressure and establish urinary flow
* Observe vital signs four hourly
* Save all urine and send to laboratory for investigations
* Record time of voiding and volume
* Monitor patients or signs of oliguria or hemorrhage
* Detect the presence of hematuria
* Palpate areas around the lower ribs, upper lumbar vertebrae, flank and abdomen for palpable mass and tenderness
* Outline the area of original mass with a marking pencil

Conservative management

* Indicated in minor injuries
* Complete bed rest
* Administer intravenous fluids
* Antimicrobial drugs to prevent infection
* Meticulous observation and evaluation of patient for the first few days
* Monitor vital signs to detect evidence

Surgical exploration/ intervention

* Removal or repair of the affected kidney, urethra or bladder
* Urethra
* Pre and post operative care
* Educate the patient on home health care
* Ensure follow up

**Complications**

**Early complications**

* Re-bleeding
* Fistula formation
* Sepsis
* Urine extra-vasation
* Sepsis

**Later complications**

* Hypertension
* Stone formation
* Urethral strictures
* Impotence more in men
* Infection
* Cystitis
* Loss of renal function
* Urine incontinence

RENAL TUMOURS

**CA Prostate**

It is a neoplasm of a prostate gland OR it’s a hormone dependant adeno carcinoma (malignant growth of a glandular epithelial tissue)

Its stimulated by the testosterone hormone thus is and androgen dependant cancer

It’s inhibited by the female estrogen hormone

The patient may be diagnosed as result of presenting with pathological bone fracture due to metastasis

**Risk factors include:**

Increase in age especially in men above 50 years of age

Familial predisposition

Excessive ingestion of diet rich in red meat

Habitual consumption of fatty foods

**CA prostate can spread through:**

Invasion of the surrounding tissue

Hematogenous and lymphatic spread thus causing involvement of pelvic bones

**Signs and symptoms**

* Obstructive symptoms i.e encroachment of the bladder neck e.g urgency in micturation, reduced stream of urine and hesitancy
* On digital rectal exam the prostate has a nodular consistency
* Back pain denoting metastasis or spread of CA to the spine
* Acid phosphatase get elevated in blood
* Presence of blood In urine and semen due to invasion of urethra and the bladder
* Painful ejaculation
* Hip pain due to metastasis to the pelvic bones
* Anemia due to bone marrow involvement
* Weight loss
* Oliguria
* Nausea and vomiting
* Presence of prostate specific antigen

**Diagnosis**

* Serum assay phosphatase
* PSA levels are elevated
* Digital examination to rule out nodular consistency
* Pelvic ultrasound or CT scan of the pelvis
* Rule out involvement of the pelvic bones
* Urinalysis
* Biopsy (fine needle aspirate) for histological exam
* Trans-rectal MRI
* Trans-urethral ultra sound is indicated when PSA level’s are elevated

**Management**

1. **Surgical management**

It involves : prostatectomy which may involve total removal of the prostate gland

: Orchidectomy/ ochiectomy which is removal of the testes which removes the stimulating effect on the CA. i.e testosterone

1. **Hormonal manipulation**

These involves estrogen therapy to reduce the size of the tumour e.g stilbestrol 5mg tds

Administration of anti-adrogenic drugs e.g casodex 50mg od for a month

Administer L.H releasing hormone agonist e.g zoladex 3.6 mg s.c depot every 28 day, which has effect on suppressing testicular androgen

1. Radiation therapy
2. Cyrosugery/ cryotherapy
3. Treatment of existing UTI’s
4. Chemotherapy

**Complications of CA prostate**

* Anemia
* Pathological fracture
* Retrograde ejaculation post prostatectomy
* Hemorrhage as a complication of prostatectomy

**CANCER OF THE BLADDER**

It arises from transitional cell epithelium of the bladder commonly

Common in people aged 50-70 years

Common in men than women

It is considered as an industrial disease because it affects people in rubber and dye industries

**There are two types CA bladder**

Superficial 80-90 % of the cases and arises from the urothelium

Squamous cell and adenocarcinoma type

**Risk factors of CA bladder**

Cigarette smoking- it most predominant cause

Environmental carsinogens e.g paint,dyes, rubber etce

Recurrent or chronic bacterial infection

Bladder stones

High urinary PH (alkaline urine)

High cholesterol intake

Pelvic radiation therapy

CA colon and rectum

**Signs and symptoms**

Painless hematoma

Acute anuric renal failure if both ureters are affected

Pain due to obstruction of the ureters and hydronephrosis

Urgent, frequent need to micturate

Pelvic and back pain due to metastasis

**Diagnosis**

Routine microscopic exam or other tests of urine may detect and pus cells

Cytology detects cancer cells

Cytography or intravenous urography may show irregularity in contour of bladder suggesting a possible tumor

Ultrasound scanning, CT scan or MRI may also reveal an abnormality in the bladder

Biopsy taken for microscopic exam by use of a cystoscope passed through the urethra

**Management**

Superficial cancers may be removed completely during cystoscopy

Total or partial removal of bladder where cancers have grown deep into or through bladder wall and can’t be completely removed through a cystoscope

Removal of lymphnodes in area to determine whether cancer has spread

Radiation therapy alone or in combination with chemotherapy sometimes cures the cancer

A method of draining urine if the bladder is totally removed should be devised

There are two methods which include:

**Orthotopic neo-bladder**- a reservoir is connected to the urethra where-by the patient learns to empty this reservoir by relaxing the pelvic flour muscles and increasing pressure within the abdomen so that urine passes through the urethra very much as it would naturally. Most patients are dry during the day but some incontinence may occur at night.

**Continent cutaneous urinary diversion**- the reservoir is connected to stoma in the abnormal wall. An external bag isn’t needed because urine remains in the reservoir until the patient empties it by inserting a catheter through the stoma into the reservoir which is emptied at regular interval throughout the day.

**CANCER OF THE KIDNEY**

**Signs and symptoms**

Hematuria is the common first symptom

Urine may be visibly red

Pain in side and fever

High blood pressure because of inadequate blood supply

Abnormally high blood cell count

Diagnosis

Intravenous urography, ultrasound scanning or CT scan may used to visualize the tumor

MRI may produce more information about how far the tumor has spread to nearby structures including veins

Fluid may be aspirated with a needle if the tumor is cyst

X-ray studies in preparation for surgery to provide more information about the tumor and arteries supplying it

**Treatment**

Surgical removal of the affected kidney and lymph nodes can provide reasonable cure if the cancer hasn’t spread beyond the kidney

Treating the cancer by enhancing the immune system ability to destroy it causes some tumors to shrink and prolongs survival

Cancers of the renal pelvis and ureters  
cancer can occur in the cells lining the renal pelvis (transitional cell carcinoma of the renal pelvis) and the ureters

**Signs and symptoms**

Hematuria

Crampy pain in the flank or lower abdomen may occur if urine is obstructed

**Diagnosis**

Intravenous urography or retrograde urography

CT scans help distinguish a kidney stone from a tumor or blood

Microscopic exam of urine may show cancer cells

A fiber optic divice- ureteroscope or nephroscope may be used to view and treat small tumors

**Treatment**

Nephro ureterectomy (removal of kidney and ureter) may be done if the cancer hasn’t spread

if the cancer has spread, chemotherapy is used

The prognosis is good when a cancer hasn’t spread and can be completely removed surgically

**HYDRONEPHROSIS**

Def: Is distension (dilation) of the kidney with urine, caused by backward pressure on the kidney when the flow of urine is obstructed

**Pathophysiology**

Following obstruction of urine flow since it flow out of the kidney a extremely low pressure, urine backs up in the small tubes of the kidney and the central collecting area (renal pelvis), distending the kidney and putting pressure on its delicate tissues

The pressure from prolonged and severe hydronephrosis ultimately damages tissue so that kidney function is gradually lost.

**Causes**

* Ureteropelvic junction obstruction (an obstruction located at the junction of the ureter and renal pelvis.

The causes include:

* Structural abnormalities e.g insertion of ureter into the renal pelvis is too high
* Kinking in this junction resulting from a kidney shifting downwards
* Stones in the renal pelvis
* Compression of the ureter by fibrous bands, an abnormally located artery or vein or tumor
* Obstruction below the junction of the ureter and renal pelvis or from backflow of urine from the bladder

Causes include

* Stones in the ureter
* Tumors in or near the ureter
* Narrowing of the ureter from birth defect, an injury, an infection, radiation or surgery
* Disorders of the muscles or nerves in the ureter or bladder
* Formation of fibrous tissues in or around the ureter resulting from surgery, X-ray or drugs
* Ureterocele (bulging of the lower end of a ureter into the bladder)
* Cancers of the bladder, cervix, ureters, prostate, or other pelvic organs
* Obstruction that prevents urine from prostate enlargement, inflammation or cancer
* Backflow of urine from the bladder resulting from a birth defect or an injury
* Severe urinary tract infection temporary preventing the ureter from contracting
* Occasionally hydronephrosis occurs during pregnancy if the enlarging uterus compresses the ureters. Hormonal changes during pregnancy may aggravate the muscular contractions of ureters that normally move urine to the bladder

NB this type of hydronephrosis usually ends when the pregnancy ends, although the renal pelvis and ureters may remain somewhat distended afterward

**Signs and symptoms**

* Excruciating, intermittent pain in the flank on the affected side
* Attack of dull, aching discomfort in the flank on the affected side
* Urinary tract infections
* Discomfort in the area of the bladder
* Blood test shows high urea levels
* Intestinal symptoms e.g nausea, vomiting and abdominal pain

**Diagnosis**

* Ultrasound scanning
* Cystoscopy
* Intravenous urography
* Physical examination

**Treatment**

* Treat urinary tract infection and kidney failure promptly
* In acute hydronephrosis, urine that has accumulated above the obstruction in the kidney is drained as soon as possible by use of a needle inserted through the skin
* A catheter may also be inserted to the renal pelvis to temporarily drain the urine if pain is severe
* Chronic hydronephrosis is corrected by treating the cause and by relieving the urinary obstruction
* A narrow or abdominal section of the ureter may be surgically removed and the cut ends joined together.
* If the junction of the ureters and bladder is obstructed, the ureters can be surgically detached the attached to a different part of the bladder.
* If the urethra is obstructed, treatment can include drugs such as hormone therapy for prostate cancer, surgery or enlargement of the urethra with dilators.

**Complications**

-Pyelonephritis

-Hypertension

-Renal failure

**FISTULA**

Def: Is an abnormal passage between cavities or between a cavity and the surface or between a cavity and the surface of the body

**Sites of Urine Leakage through the Vagina**

* Vesico vaginal fistula i.e. from bladder
* Uretero vaginal fistula i.e. from ureter
* Urethro vaginal fistula i.e. from urethra

**Vesico vaginal fistula**

It’s an abnormal opening between the bladder and the vagina which might result from prolonged pressure in neglected obstructed labor

The genital tract fistula may occur between the vagina or uterus and any adjacent organ that the most frequent concentrated fistula are between vagina and bladder

**Pathophysiology**

During obstructed labor the prolonged pressure at baby’s head against the mothers pelvis cuts off blood to soft tissue surrounding the bladder and vagina

The injured tissue rots away/ sloughing leaving a hole or fistula

The obstruction can occur if woman’s pelvis is too small (contracted pelvis). If baby’s head is too big compared to women pelvis called cephalopelvic disproportion (CPD)

**Causes**

* Obstetric injury
* Surgical trauma during hysterectomy
* Radiation in cervical Ca
* Direct trauma e.g penetrating injuries of the anterior wall
* Anterior episiotomy or tear
* Congenital malformation

**Predisposing factors**

* Early pregnancy
* Lack of education
* Low status of woman in the society
* Gender discrimination
* Culture and tradition which encourage early marriage
* Limited access to medical services

**Signs and symptoms**

* Urine leak into vagina
* Vaginal and vulva tissue become excoriated
* Chronic UTI
* Experiences wetness and a sensation or feeling unclean
* Vaginal fistula produces severely distressing psychosocial problems
* Disruption of social activities
* Client become withdraw
* Seek medical attention late or feel embarrassed

**Diagnosis**

Methylene dye test is done in-case of vesico-vaginal fistula

Introduction of dye is also done in recto-vaginal fistula

X-ray is done after introducing a dye

Pelvic ultrasound can confirm the diagnosis

Management urinary fistula

* For small lesions:
  + Bladder catheter
  + Wait for spontaneous closure
* For larger lesions:
  + Wait until “healed”
  + Then close from below or above
  + 3-layered closure

Management of recto-vaginal fistula

* May require a diversionary colostomy
* Must treat the underlying problem when there is inflammatory disease or cancer
* May also require anal sphincter repair

**NEUROGENIC BLADDER**

Def: A neurogenic bladder is the loss of normal bladder function caused by damage to part of the nervous system

It may result from a disease, an injury or a birth defect affecting the brain, spinal cord or nerves leading to the bladder, its outlet or both

**Under active**- it is unable to contract (non contractile) and unable to empty well

**Over active (spastic**)- emptying by uncontrolled reflexes

**Causes**

Under active bladder usually results from interruption of local nerves supplying the bladder

Birth defects e.g spina bifida or myelomeningocele affecting the spinal cord

Over active bladder usually results from an interruption of normal control of the bladder by the spinal cord and brain

Another common cause is an injury or disorder e.g multiple sclerosis affecting the spinal cord which may also result in legs paralysis or arms

**Symptoms**

**Under active bladder**

* It doesn’t empty
* Un-painful enlargement because it has little or no local nerve supply
* It may remain large but constantly leaking small amount of urine
* Bladder infection may occur because the pool of residual urine provides the condition that encourages bacterial growth
* Stones may occur following permanent placement of a catheter due to chronic bladder infection

Overactive bladder

It fills and empty without control and with varying degrees of warning (controls involuntarily)

There may be damage of the kidney because of the pressure and backflow of urine from the bladder up through the ureters

**Diagnosis**

* Physical examination
* X-ray imaging using radio-opeque substance injected through a vein
* Ultra sound scanning imaging
* Cystoscopy to look into the bladder
* Cytsometrography (it measures pressure within the bladder and urethra by connecting it to a meter)

**Treatment**

* When a underactive bladder is caused by a neurologic injury, a catheter may be inserted through urethra to drain it continuously
* Insert the catheter immediately to prevent muscle damage from overstretching and to prevent bladder infection
* Intermittent self catheterization is preferred whereby the patient uses a catheter that he can insert and remove to drain the bladder
* People who have overactive bladder may need a catheter if spasms of the bladder outlet prevent the bladder from emptying completely
* For quantriplegic males who can’t catheterize themselves, the sphincter muscle may have to be cut to allow emptying and an external collecting device can be worn
* Electric stimulation may be applied to the bladder, the nerves that control the bladder or spinal cord to induce the bladder to contract
* Anticholinergic drugs may be used to relax the bladder and thus improve control of an overactive bladder
* Surgery to divert the urine to an external opening (ostomy) made in the abdominal wall or to increase the bladder size is sometimes recommended
* Kidney function is monitored closely and kidney infection treated promptly
* Drinking at least eight glasses of fluids daily is recommended
* A paralysed person position is changed frequently and others are encouraged to walk as soon as possible

**BENIGN PROSTATE HYPERPLASIA (BPH)**

**Def**: It is an age related non-malignant enlargement of the prostate gland. It’s one of the most common diseases of the aging men. Occurs mainly in males between age of 50 – 70 years

**Clinical features**

* Increased frequency in micturation
* Nocturia
* Hesitancy and difficulty in voiding
* Micturation takes long
* Chronic urine retention (incomplete emptying of bladder)
* There is bladder distension and pain
* Hematuria
* Per rectal exam the prostate gland is enlarged

**Diagnosis**

* Clinical history
* Physical examination
* Digital rectal exam
* Urinalysis
* Serum creatinine
* Prostate specific antigen testing
* Urine flow rate
* Measurement of resdue urine volume
* CT scan
* MRI
* Abdominal X-ray

**Management**

**Pre-operative management**

* Patients are usually admitted with urine retention
* This is relieved through catheterization or suprabic cystomy
* Carry out the investigations that are necessary before theatre and blood for FXM, HB
* Treat abnormalities detected before surgery
* Give fluids to correct fluid electrolyte imbalances
* Give a well balanced diet
* Encourage perineal exercise to help the bladder maintain the muscle tone
* Explain the procedure to the patient and obtain a written consent
* Reassure the patient to alley anxiety

**Postoperatively management**

* Give the general post operative care
* Discourage the patient from voiding
* Continue bladder irrigation using normal saline for three days or 72 hours
* Ensure there is free flow of drainage by:
* Not lifting the urinary bag above the level of the bladder to avoid urine back flow
* Not kinking the drainage tube
* If the drainage is clear, the suprapubic catheter is removed in the second day post operative
* The patient is on ducolax which prevent constipation once oral feeding is initiated
* Palpate the lower abdomen to check for any blockage which may produce tension and distension of the bladder
* Change the drainage bag and dressing for bleeding from incision site
* Assess for pain and before giving any analgesic ensure that there is no obstruction of the tubes
* Maintain input output fluid chart. This should include amount used in bladder irrigation

**Closely observe for the following**

* Flashing of the tubes to ensure no blockage takes place
* Monitor the color of urine/ should change to amber
* Observe for leakage of urine after removal of supra pubic catheter
* Ensure bed rest
* Remove stitches on ninth to tenth day
* Remove urinary catheter once the supra pubic wound is healed
* Observe for difficulty in micturation
* Encourage patient to avoid strenuous exercise

**HYPOSPANDIAS AND EPISPADIAS**

Hypospadias and epispadias are congenital anomalies of the urethral opening.

In hypospadias, the urethral opening is a groove on the underside of the penis.

In epispadias the urethral opening is on the dorsum.

These anatomic abnormalities may be prepared by various types of plastic surgery, usually when the boy is very young.

**URETHRAL STRICTURES**

**Def**: Is a condition in which a section of the urethra is narrowed.

It can occur congenitally or from a scar along the urethra

Traumatic injury to the urethra (e.g from instrumentation or infections) can result in strictures.

Treatment involves dilation of the urethra or in severe cases, urethrotomy (surgical removal of the stricture)

**DIVERTICULI**

Def: Bladder diverticulum, an outpouching of the mucosa through the muscular wall of the bladder, is a multifactorial disease process that can be either acquired or congenital.

**Signs and symptoms**

Although small diverticuli are usually asymptomatic, a large diverticulum may result in hematuria, urinary tract infection, acute abdomen due to its rupture, acute urinary retention, or neoplasm formation.

**Diagnosis**

CT scan abdomen and pelvis (confirmatory)

Pelvic ultra sound

Full hemogram

IV contrast to look for possible ichaemia

The congenital form of bladder diverticuli usually manifests in children younger than ten years old and is thought to be due to weakness of the ureterovesical junction or a posterior urethral valve [3]. In the former instance, weakness of the junction allows outpouching to occur, and, in the latter instance, increased intravesical pressure leads to wall stress and mucosal outpouching.

The acquired form generally occurs in males over the age of 60, and diverticuli are often located along the lateral bladder walls [3, 4]. Similar to the mechanism in children with posterior urethral valves, it is thought that intravesical pressure increases from other underlying pathology, such as prostatic disease or neurologic processes.

**Management**

The patient is admitted to the hospital (surgical ward)

Patient is given IV antibiotics and analgesics to control pain, with a Urology Consult.

The patient is scheduled for cystoscopy, surgical removal of the pouch and stone removal if any.

Pre and post operative management is done as for the other patients

**Complications**

 Intra diverticular [transitional cell carcinoma](http://radiopaedia.org/articles/transitional-cell-carcinoma-of-the-urinary-tract) 1-10%

 [Bladder stones](http://radiopaedia.org/articles/bladder-calculus-1)

 [Bladder rupture](http://radiopaedia.org/articles/urinary-bladder-rupture)

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